IN THE SPECIFICATION:

Page 4, please delete paragraph number [0006] and replace it with the following paragraph:

[0006] A principal aspect of this invention is the use of Fractional Fourier transform properties of lenses or other optical elements or environments to introduce one or more positive-definite optical transfer functions at various locations outside the Fourier plane so as to realize, or closely approximate, arbitrary non-positive-definite transfer functions. Specifically this aspect of the invention encompasses an optical system for realizing optical filtering through the use of at least one optical element outside the Fourier transform plane. By choice of the number of such elements, position of such elements, and the actual positive-definite ~~positive-define~~ transfer function used for each element, arbitrary non-positive-definite transfer functions can be approximated by the entire system, and designs can be straightforwardly obtained by methods of approximation. However, there are several additional aspects to the invention relating to implementing, expanding, or utilizing this underlying aspect.

Page 8, please delete paragraph number [0022] and replace it with the following paragraph.

[0022] Figure 2 shows a Classical Fourier Optics image processing arrangement with an optical transfer function element introduced in the Fourier plane, using two lenses to realize the Fourier plane; [[and]]

Page 8, please delete paragraph number [0023] and replace it with the following paragraph.

[0023] Figure 3 shows optics device 100 providing the exemplary introduction of two additional optical transfer function elements introduced outside the Fourier plane; ~~plane.~~

Page 8, after paragraph number [0023], please insert the following new paragraph.

[0023.1] Figure 4 shows optics device 100 of Figure 3 implemented as a monolithic optics device; and

Page 8, after paragraph number [0023.1], please insert the following new paragraph.

[0023.2] Figure 5 shows optics device 100 of Figure 3 integrated with an optics system.

Page 10, please delete paragraph number [0028] and replace it with the following paragraph:

[0028] FIG. 2 shows a Classical Fourier Optics image processing arrangement with an optical transfer function element 103 introduced in the Fourier plane 104, using two lenses 102, 105 to realize the Fourier plane 104. The optical transfer function element 103 is typically implemented via a translucent plate or similar means in this location to introduce an optical transfer function operation on the optical wavefront.

The image source 101 and a first lens 102 are separated by a distance 111 which, based on the focal length of the lens, creates a Fourier plane 104 at a distance 112 on the opposite side of the first lens 102. The image source 102 may be natural image (as with a camera), produced by an optoelectric transducer, or some other type of image source element. A second lens 105 is positioned a distance 113 from the Fourier plane on the plane's opposite side. The distance 113 is selected, based on the focal length of the second lens 105, together with distance 114 so that an observation element 106 receives a Fourier transform of the image emanating from the Fourier plane 104 ~~plane 103~~. The observation element 106 may be natural (such as a viewfinder, display surface, projection screen, or other means), optoelectric (as in a phototransistor or CCD array or other means), or some other type of observing element.

Page 12, please delete paragraph number [0031] and replace it with the following paragraph:

[0031] These multitudes of possibilities have, due to properties of materials and fabrication limitations in transcending them in the construction of the transform element 103 ~~element 104~~, been limited to transfer functions that mathematically are "positive-definite," i.e. those which affect only amplitude and do not introduce varying phase relationships.

Page 18, please delete paragraph number [0045] and replace it with the following paragraph:

[0045] A class of system embodiments of special interest provided for by the invention are those where a sequence or physically-adjacent stack of programmable light modulators, such as LCD panels, are used as the optical transfer function elements. Electrical and/or computer and/or, with future materials, optical control could then be used to alter the individual transfer function of each optical transfer function element. The latter arrangement could be implemented as an integrated optics device, perhaps including storage capabilities to storage the transfer function pixel arrays and perhaps even an associated processor for computing the individual optical transfer function element transfer function pixel arrays. The result is a powerful, relatively low-cost, potentially high-resolution real-time integrated optics image processor which would perform optical transformations otherwise requiring many vast orders of magnitudes of computation power. Further, the image source and observation elements may in fact be optoelectric transducers (LED arrays, LCDs, CCDs, CRTs, etc.) and may be further integrated into a comprehensive system which ~~, the system~~ can further be abstracted into a more general purpose complex-number arithmetic optical computing array processor of tremendous processing power. The invention provides for the range of these integrated optical processor architectures to readily implemented through photolithography or beam-controlled fabrication methods.

Page 20, after paragraph number [0049], please insert the following new paragraph.

[0049.1] For instance, Figure 4 shows the optics device of Figure 3 configured as a monolithic device 120 providing optical filtering according to various

techniques disclosed herein. One alternative is to omit image source 101 and image observation element 106, resulting in optics device 125. If desired, as shown in Figure 5, optics device 100 may be implemented within optics system 130, thus defining an integrated optics system according to an implementation of the present invention.

Page 23, please delete paragraph number [0053] and replace it with the following new paragraph:

[0053] A particularly useful application of this would be to use only all-pass phase-variable elements in a compound optical system set up to operate as an electronically adjustable lens. By varying the phase-shifts of the all-pass filter elements, the Fractional Fourier transform effects of a lens of varying focal length and/or varying separation distance from the affiliated optics can be synthesized. Various compound optics arrangements can therefore ~~be therefore~~ be made utilizing this electronically controlled synthesis of effective focal length and/or varying separation distance. One important application would be the creation of an electronically adjustable lens with variable focus and variable zoom capabilities. The latter is a straightforward ~~straightforward~~ application of the electronically controlled variable phase-shift aspect of the invention.